Remarks

Claims 1-20 are currently pending. Claims 1 and 11 have been amended to better define the present invention. The specification has been amended to correct numerous typographical errors. No new matter has been added by these amendments.

The Applicants would like to thank the Examiner for the telephone interview on December 21, 2004 with Jocelyn Ram (#54,898) in which the proposed amendment to claim 1 was discussed. Examiner agreed that this amendment appeared to distinguish the present invention from the prior art.

Rejection under 35 USC §103(a)

Claims 1-20 were finally rejected under 35 USC §103(a) as unpatentable over Sternitzke[1] in view of Reed.[2] The action stated that Sternitzke teaches all the elements of the presently claimed invention, except for the addition of sinter additives to the sol, which, the action further stated, is taught by Reed's suggestion of adding a small amount of a wetting liquid (*i.e.*, a sinter additive) to alumina during sintering to improve density and lower the temperature required for sintering.

Independent claims 1 and 11

Claim 1, as amended, recites:

Method for the production of Al_2O_3/SiC nanocomposite abrasive grains, comprising the steps of:

mixing an aluminum-oxide containing sol with sinter additives and SiC nanoparticles to obtain a mixture; and

[1] Review: Structural Ceramic Nanocomposites, *Structural Ceramic Composites-composites*, P11: S0955-2219(96)00222-1, pp. 1061-1082, cited by the Applicants.

[2] Introduction to the Principles of Ceramic Processing, John Wiley and Sons, New York, New York, pp. 463-464, 1988.

subsequently gelling, drying, calcinating and sintering the mixture to obtain nanocomposite abrasive grains, the sintering being conducted by heating in the range between 1300°C and 1600°C,

the foregoing steps being sufficient in themselves to produce the Al_2O_3/SiC nanocomposite abrasive grains.

Notably, the present invention has eliminated the hot-pressing densification step required by the methods taught by both Sternitzke and Reed to obtain effective abrasive grains. Following the Examiner's suggestion, this limitation has been added to claim 1 to better define the present invention. As Applicant stated in the previous response, Sternitzke actually teaches away from any process not involving hot-pressing, "Such routes may be in conflict with the nanocomposite concept itself because grain growth and sinterability are drastically reduced by small inert particles..." and summarizes that "Nanocomposites with considerably improved mechanical properties have, to date, *only* (emphasis added) been achieved in hot-pressed materials."

As discussed in the instant specification (paragraphs [0035-0036]), hot-pressing is an expensive and complex step which is considered unsuitable for mass, industrial production of abrasives. In contrast to such methods, "*the production of the abrasive grains according to the invention proceeds in hydrochemical fashion via a direct sol/gel route with the use of crystallization seeds...*", a method that requires no hot-pressing. The present invention extends the sintering ability of the dried and calcinated gel by prior addition of α-Al_2O_3 crystals during the sol conditioning in order to make possible densification without any pressing by means of sintering, such as, for example, under inert conditions with a rotary tube. This advantageously simplifies the production process and reduces costs, thereby enabling an economically feasible mass production of Al_2O_3/SiC nanocomposite abrasives.

Furthermore, Reed does not suggest addition of a sinter additive and this term is not mentioned by Reed at all. The Examiner has incorrectly interpreted the silicate phase taught by Reed as a "sinter additive" in the sense of the present invention (*e.g.*, used to slow or stop crystal growth.) Reed's additive appears to comprise a glass phase that during sintering of the ceramic becomes liquid due to its low melting point and then coats the particles of the basic material,

thereby simplifying their densification. Silicate-containig compounds are able to act as a glass phase exclusively, however, a silicate is not a sinter additive according to the present invention.

Additionally, the method of the present invention yields abrasive grains with improved product characteristics, such as recited in **claim 11**, including a *hardness of > 16 GPa, a density of > 95% of the theoretical limit, and an SiC portion of between 0.1 and < 5 mol %, relative to the Al_2O_3 matrix, wherein the SiC particles are present in the Al_2O_3 matrix as well as intragranularly and the abrasive grain shows a performance factor LF_{25} > 75 % in the single-grain scratch test.* During hot-pressing, the hardness achieved is only 17.5 GPa (see Sternitzke, page 1066, par. 2.2.2), whereas abrasive grains produced by methods in accordance with the present invention achieve hardnesses of more than 19 GPa. The instant action asserts that a similar process would be expected to yield a nanocomposite with the claimed physical properties. As demonstrated above, however, the method of the present invention is quite distinguishable from the processes taught by Sternitzke and Reed, and therefore such an assumption relating to the physical properties is not justified. The simple combination of prior art in accordance with the traditional criteria set by any person skilled in the art is insufficient to develop the presently claimed abrasive material.

Thus, neither Sternitzke nor Reed, alone or in combination, teaches the present invention as recited in amended, independent claims 1 and 11. Applicants respectfully request reconsideration and withdrawal of the rejections of these claims.

Dependent claims 2-10 and 12-20

Claims 2-10 and 12-20 include all of the limitations of claim 1, as amended, or alternatively claim 11, as amended. As the patentability of claims 1 and 11 has been established above, it is respectfully submitted that claims 2-10 and 12-20 are similarly patentable over the cited combination and withdrawal of this ground for rejection is requested.

Conclusion

For at least the above noted reasons, Applicants respectfully submit that claims 1-20 are in a condition for allowance, and respectfully request that the Examiner reconsider and withdraw the outstanding rejections. Favorable consideration and allowance are earnestly solicited.

Should there be any questions after reviewing this paper, the examiner is invited to contact the undersigned at 617-854-4000.

Respectfully submitted,
PAUL MOELTGEN, *et al.*
Applicants

Dated: December 27, 2004

By: _____
Jerry Cohen
Reg. No. 20,522
Attorney for Applicants